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ORIGINAL REPORT

Increasing Incidence of Testicular Germ Cell Tumors Among Black Men in the United States

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ABSTRACT

Purpose

There has been marked disparity in the incidence of testicular germ cell tumors (TGCT) among white and black men for a number of decades in the United States. Since at least the beginning of the Surveillance, Epidemiology, and End Results (SEER) Program in 1973, incidence rates among white men have been five times higher than rates among black men. In addition, rates among white men have been increasing, whereas rates among black men have remained stable. However, a recent examination of ethnic-specific rates suggested that the incidence among black men may have begun to change in the 1990s.

Patients and Methods

TGCT incidence data from nine registries of the SEER Program were analyzed for the years 1973 to 2001. Trends were examined separately for seminoma and nonseminoma.

Results

Analyses found that the incidence of TGCT began to increase among black men between the 1988 to 1992 and 1993 to 1997 periods. Before that time, incidence among black men had decreased by 14.8%. Between 1988 to 1992 and 1998 to 2001, however, the incidence increased by 100%, with the incidence of seminoma increasing twice as much (124.4%) as the incidence of nonseminoma (64.3%). Over the 29-year time period, there was no evidence of a change in the proportion of tumors diagnosed at earlier stages among black men. In contrast, the proportion of tumors diagnosed at localized stages significantly increased among white men.

Conclusion

The incidence of TGCT among black men has increased since 1988 to 1992. Although the reasons for this increase are unclear, screening and earlier diagnosis of TGCT do not seem to be factors.

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INTRODUCTION

Testicular germ cell tumors (TGCT) are the most common malignancy among US men aged 15 to 34 years.[1] Although the overall population incidence has been increasing in the United States for a number of decades, there is striking ethnic disparity in rates.[2] Since the initiation of the Surveillance, Epidemiology, and End Results (SEER) Program in 1973, the incidence rate among white men has been, on average, five times higher than the incidence rate among black men. Although rates among white men have increased throughout the entire duration of SEER, rates among black men, in the past, have remained largely unchanged.

In a recent publication, we noted that the incidence rate of TGCT among black men may have begun to increase in the United States.[2] Examining SEER data through 1998, we reported that the incidence of TGCT among black men seemed to increase in the 1990s. However, that observation was based on a single data point. With 3 more years of data now available, we

again examined the data to determine whether the increase was still evident and, if so, whether the increase seemed to be associated with screening.

PATIENTS AND METHODS

Incidence data for TGCT were obtained from the SEER Program, a population-based cancer registry system that includes approximately 10% of the US population.[1] Data covering the years 1973 to 2001 were drawn from the nine registries that have been members of SEER since at least 1975 (Connecticut, Hawaii, Iowa, New Mexico, Utah, San Francisco–Oakland, Detroit, Seattle–Puget Sound, and Atlanta). TGCT patients were identified by International Classification of Disease for Oncology morphologic codes (classic seminoma: codes 9060 to 9062 and 9064; nonseminoma: codes 9065 and 9070 to 9102). Spermatocytic seminomas (code 9063) were not included in the analysis because they seem to differ etiologically from other TGCTs. The SEER*Stat statistical package[1] was used to calculate incidence rates that were age-adjusted to the US 2000 standard population. To describe age-specific trends by year of diagnosis and year of birth, rates were calculated for 5-year age groups and 5-year time periods to provide more stable estimates because the numbers of tumors among black men have been small in past years (ie, fewer than 10 tumors per year in some years). Rates were plotted by calendar year of diagnosis and calendar year of birth using a logarithmic scale for the ordinate. Logistic regression was used to examine whether there were significant trends in the proportion of tumors being diagnosed over time at localized stages.

RESULTS

During the entire time period (1973 to 2001), the incidence of TGCT increased in black men by 70.4% (Fig 1). However, the rates did not start increasing until 1988 to 1992. Before that time, the incidence of TGCT in black men had declined modestly (−14.8%). In the interval between 1988 to 1992 and 1998 to 2001, however, both seminoma and nonseminoma rates increased. Although the overall TGCT rate of increase was 100%, the incidence of seminoma increased more dramatically (124.4%) than the incidence of nonseminoma (64.3%).

In contrast to the incidence among black men, the rates among white men increased throughout the entire 29-year period (Fig 1). However, the increase among white men was less pronounced between 1988 to 1992 and 1998 to 2001 (9.9%) than it was in previous years. In the interval between 1988 to 1992 and 1998 to 2001, the incidence of seminoma increased 16%, and the incidence of nonseminoma increased 0.8%.

Because an increase in incidence might be the result of increased awareness and earlier diagnosis of TGCT, proportions of tumors by stage (ie, localized, regional, distant, and unstaged) were examined by time period. Among black men, there was no evidence that tumors were being diagnosed at earlier stages (Fig 2). The proportion of localized tumors, which decreased slightly from 63.3% to 58.9%, did not vary significantly over time ($\chi^2 = 0.04$, $P = .95$). In contrast, among white men, a greater percentage of tumors were diagnosed at localized stages with each time interval ($\chi^2 = 250.43$, $P < .0001$). Whereas 55.4% of tumors in white men were localized in the 1973 to 1977 period, 72.7% were localized in the 1998 to 2001 time period (Fig 3).

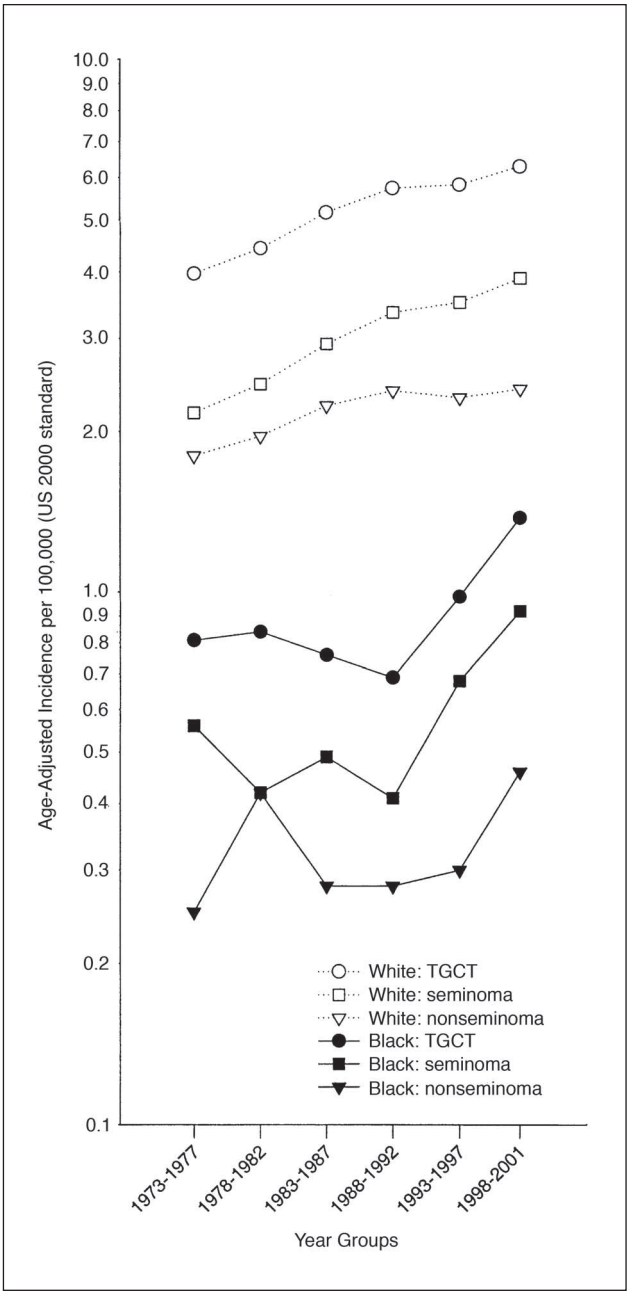

Fig 1. Incidence of testicular germ cell tumors (TGCT) among black and white men (Surveillance, Epidemiology, and End Results data, 1973 to 2001).

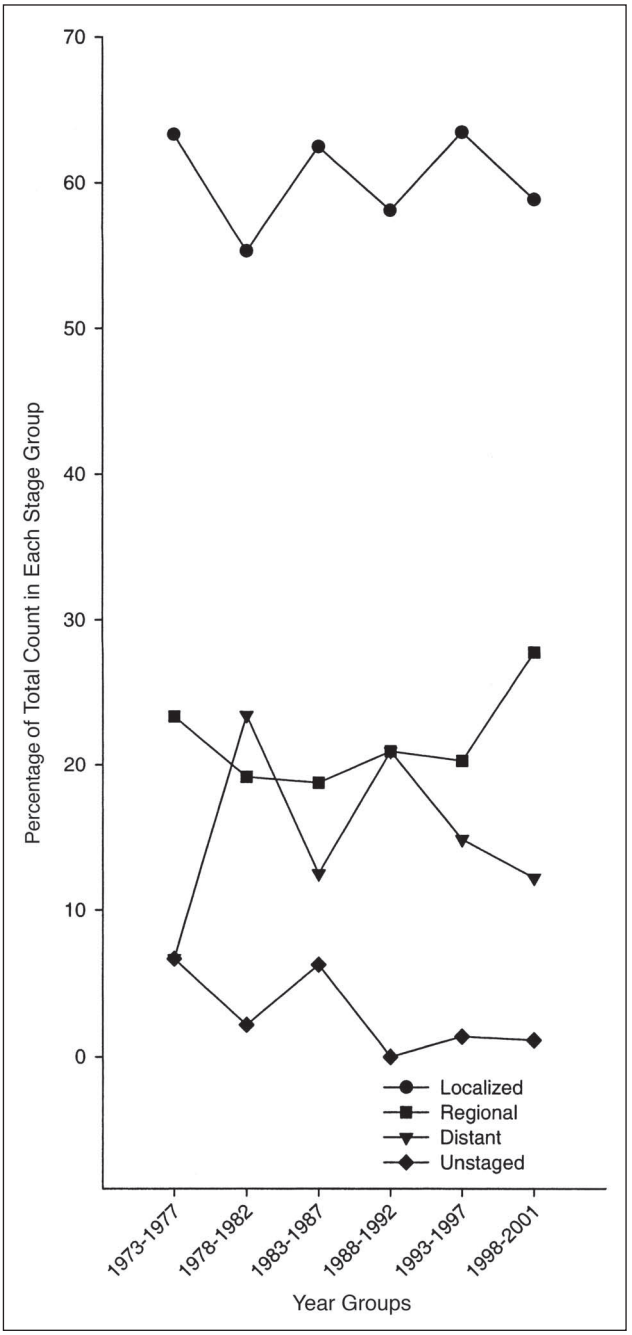

Fig 2. Percentage of testicular germ cell tumors by stage among black men (Surveillance, Epidemiology, and End Results data, 1973 to 1977 and 1998 to 2001).

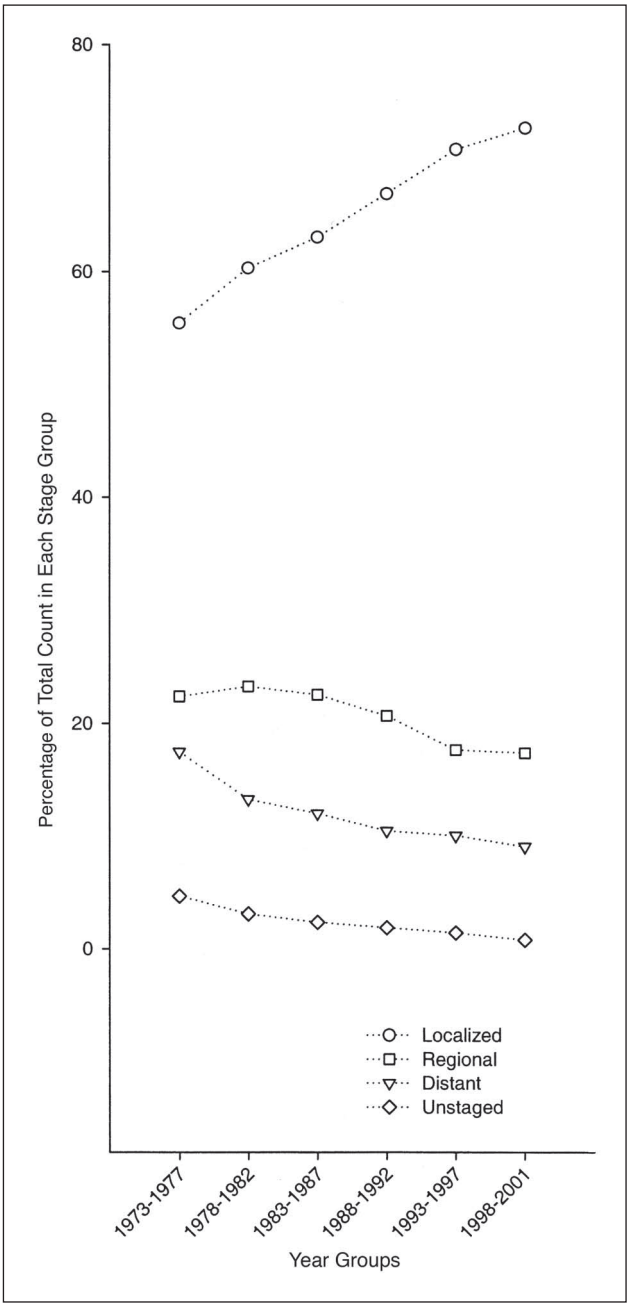

Fig 3. Percentage of testicular germ cell tumors by stage among white men (Surveillance, Epidemiology, and End Results data, 1973 to 1977 and 1998 to 2001).

Examination of age-specific rates among black and white men for the period of 1998 to 2001 did not reveal striking differences. Seminoma rates among all men peaked in the age group of 35 to 39 years. Nonseminoma rates peaked at a slightly younger age (20 to 24 years) among white men than among black men (25 to 29 years). During the entire 29-year period, the 35- to 39-year-old group experienced the greatest increase in rates (610.6% among black men; 117.8% among white men). During the interval between 1988 to 1992 and 1998 to 2001, however, older men experienced greater increases in incidence than younger men. Among black men, the 45- to 49-year-old and 50- to 54-year-old age groups saw their rates increase more than 200%, whereas among white men, the 45- to 49-year-old group saw the greatest increase (33.2%). There were no great differences between black and white men in

distribution of morphologic types or laterality of TGCT in the 1998 to 2001 time period (Table 1).

Among the nine registries, the incidence rate of TGCT among black men in 1998 to 2001 was highest in the San Francisco–Oakland registry (3.03 per 100,000 men), and the rate of increase between 1988 to 1992 and 1998 to 2001 was the greatest in the San Francisco–Oakland registry (252.3%). In contrast, the incidence rate for white men during 1998 to 2001 was highest in the Seattle–Puget Sound registry (7.0 per 100,000 men).

DISCUSSION

Although it seems clear that TGCT rates have increased among black men since 1988 to 1992, it is not clear why. It is also not clear why the rates are increasing at the same time that the rate of increase has slowed in white men. However, the lack of increase in the proportion of tumors diagnosed at localized stages argues that the increase in black men is not a result of increased awareness of TGCT. In contrast, the significant increase in localized TGCT among white men suggests that increased awareness may have contributed somewhat to the increase in rates between 1973 to 1977 and 1998 to 2001. A similar increase in localized TGCT in the United Kingdom indicates that the rates in other high-risk populations may have also been affected by heightened awareness.[3]

Even among high-risk populations, there are few well-described risk factors for TGCT, although a number of studies have pointed to the possible role of perinatal factors. Increased maternal age, increased maternal weight, decreased parity, increased socioeconomic status, and maternal smoking have all been suggested as risk factors.[4-5] Although it is possible that these factors could have influenced the incidence of TGCT among black men, they are somewhat difficult to study because the factors would have had their effects approximately 30 years before the changes

Table 1. Testicular Germ Cell Tumors: SEER, 1973-2001

Data	Black Men	White Men
No. of TGCT from 1973 to 2001	326	15,084
Incidence rate of testicular cancer 1998 to 2001*	1.59	6.49
Incidence rate of TGCT 1998 to 2001*	1.38	6.31
Increase in incidence from 1973-1977 to 1998-2001, %		
TGCT	70.4	58.9
Seminoma	64.3	79.7
Nonseminoma	84.0	33.9
Increase in incidence from 1988-1992 to 1998-2001, %		
TGCT	100.0	9.9
Seminoma	124.4	16.1
Nonseminoma	64.3	0.8
% TGCT of all testicular cancers	90.2	98.0
Peak age range at diagnosis from 1998 to 2001, years		
Seminoma	35-39	35-39
Nonseminoma	25-29	20-24
Histologic distribution of TGCT, 1998-2001, %		
Seminoma	61.4	56.2
Embryonal carcinoma	11.7	16.9
Yolk sac tumor	1.8	1.2
Choriocarcinoma	3.7	4.0
Teratoma	10.1	12.9
Nonseminoma, NOS	0.0	0.1
Mixed germ cell tumor	11.4	8.8
Seminomas by laterality, 1998-2001, %		
Right sided	45.6	51.6
Left sided	47.4	47.3
Bilateral	0.0	0.1
Unknown	7.0	1.0
Nonseminomas by laterality, 1998-2001, %		
Right sided	54.8	53.7
Left sided	41.9	45.4
Bilateral	0.0	0.0
Unknown	3.2	0.9

Abbreviations: SEER, Surveillance, Epidemiology, and End Results; TGCT, testicular germ cell tumor; NOS, not otherwise specified.
*Age-adjusted rate per 100,000 men (US 2000 standard).

in testicular cancer rates. Thus, changes in perinatal factors would have started taking place around 1960. Although the prevalence of all of the suggested factors has changed since that time, it is not clear when the ethnic-specific changes occurred. The data on age at first birth, dating back to 1970, indicate that the mean age of birth among all US women increased from 21.4 to 24.9 years in the subsequent 30 years.[6] Although mean age at first birth of white mothers remained higher (25.9 years) than that of black mothers (22.3 years) in 2000, the increase in age at first birth was similar in the two groups between 1989 and 2000. Maternal weight has also been increasing, but whether those gains date back to 1960 is not clear.[7] Similarly, maternal cigarette smoking has been decreasing, but those decreases may not have occurred before the 1980s.[8]

Although a number of nonperinatal factors, such as occupation, physical activity, and diet, have been examined for associations with TGCT, few have been consistently linked. However, one factor that has been associated with TGCT since the mid-1980s is infection with HIV.[9] Although the TGCT increase among black men did not occur until slightly later, this lapse is consistent with a slightly later increase in Kaposi's sarcoma risk among HIV-positive black men than white men.[10] Also consistent with the SEER trends are the observations that HIV-positive men have a greater risk of developing seminoma than nonseminoma.[11] Although the reports have not specifically noted an increased TGCT risk among black men, black men in the United States are significantly more likely to be HIV positive than white men, suggesting that HIV would have a higher attributable risk among black men.[12] For example, in the time period of 2000 to 2003, HIV infection was seven times higher among black men than among white men.[13] Any HIV-TGCT link would also be more conspicuous among black men because the background rate of TGCT is much lower than the rate of white men. The introduction of highly active antiretroviral therapy in the mid-1990s decreased the risk of several AIDS-defining tumors but does not seem to have affected the risk of TGCT.[11] Thus, the incidence of TGCT may have increased as competing causes of morbidity and mortality among HIV-positive men declined as a result of highly active antiretroviral therapy.[14] If HIV is contributing to TGCT incidence, it should be noted that there is no indication that TGCTs in HIV-positive men behave differently than TGCTs in uninfected men.[15] In HIV-positive men, TGCTs can be treated as aggressively and with the same favorable prognosis.

In summary, it is unclear why rates of TGCT are increasing among black men. Changes in perinatal risk factors may have been initiated several decades ago. Alternatively, changes in risk factor exposures to men themselves may have occurred in the past 40 years. Although any discussion of risk factors remains speculative, further study of the increasing rates may prove valuable in elucidating the etiology of TGCT among all US men.

Authors' Disclosures of Potential Conflicts of Interest

The authors indicated no potential conflicts of interest.

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